

Preparation and characterization of adherent autocatalytically deposited nickel coating on carbon fiber

N.T. Manikandanath^a, Shruti Lahane^b, Pushkar D. Kanhere^c, Chen Wang^c, Zhong Chen^c, J.N.Balaraju^a

^a Surface Engineering Division, CSIR National Aerospace Laboratories, Post Bag No. 1779, Bangalore 560017

^b Birla Institute of Technology & Science, Pilani

^c School of Materials Science and Engineering, Nanyang Technological University, Singapore 639798, Singapore

Abstract

In the present study carbon fibers were successfully coated with nanocrystalline nickel using an acidic bath by electroless plating method. Coating thickness obtained was about 1.5 microns beyond that there was coating delamination. Coated fibers were characterized for various properties such as morphology, composition, structure, phase transformation temperature, resistivity and tensile strength. Field emission scanning electron microscope (FESEM) studies revealed that the coating showed nodular morphology. Energy dispersive analysis of X-ray (EDAX) showed that the coating containing about 10.5 wt.% P with balance Ni. Structural studies carried out on these coated fibers exhibited two major diffraction peaks and were assigned as C (002) and Ni (111). Differential scanning calorimetry (DSC) studies on these coated fibers exhibited a single exothermic peak at 351⁰C. Activation energy obtained for the crystallization process of high P deposit is about 215.9 kJ/mol. Bulk resistivity was measured using four-probe technique over a single coated fiber and the obtained value was around 3.2 μΩ-m. Tensile strength of these coated fibers were also carried out and observed that not much variation found in the strength of coated and uncoated fibers.

Keywords: Carbon fiber; NiP; XRD; DSC

*Corresponding author: jnbalraj@nal.res.in (J.N.Balaraju); Tel: 08025086239; Fax: 08025210113.